

Wind Tunnel Test Plan Instructions

January 6, 2011

General requirements

All test programs will require a completed and approved Wind Tunnel Test Plan. The plan will need approval of both the Test Sponsor (in this case the course instructor) and the Wind Tunnel Oversight Committee. Note the subject headings are based on a modified version of an AIAA Recommended Practice (AIAA R-092-1-2003) and are standard for all test programs in the lab. **Sample test plans are on the Wind Tunnel Sharepoint Site, listed in the Documents area.**

Note that there are a limited number of test slots available. They will be allocated on a first come first served basis. If milestones are not met, the slot(s) may be released.

Each team should have at least two (2) students who have successfully completed MANE 4910 using the JEC tunnel. Only students who have completed MANE 4910 Fluid Dynamics Laboratory are to operate the lab equipment (tunnel and instrumentation.) Otherwise, specific approval of the Wind Tunnel Oversight Committee is required to run any tests. **ALL students are required to have completed the wind tunnel lab safety training within the past year prior to working in the lab or attending the test programs. No exceptions.**

A test program leader or coordinator must be identified to facilitate the planning and testing activities. This person should have completed MANE 4910.

Test Plan Submission and Review

A test plan must be submitted and a review meeting scheduled prior to full release of the wind tunnel. This will help ensure that the test model is suited for the tunnel testing envisioned, and that the testing will meet the project needs.

Timing is dependent upon model fabrication requirements. Assuming significant component fabrication is required, this should be 4-8 weeks, at a minimum, before an expected test window is granted; ideally as early in the semester as practical, once all the information is available.

Use the following test plan instruction, as a minimum, for this review. Add any other pertinent information not mentioned in this guide.

Test Objectives

Why is testing required?

What hypothesis/analytical model is being confirmed?

A clear understanding of why you are testing vs. other alternatives, what data you specifically need and having a hypothesis on the expected results, significantly improves the probability of a successful and meaningful test program.

Data Requirements

What specific data is expected/required? What are the measurement accuracy requirements? How many operating points and measurements will be needed? Are there multiple configurations envisioned? Any special instrumentation needs? (verify sensor accuracy and integrity) What are the priorities within these data sets if time available is marginal? How will your data be recorded?

Model Design

General concept overview

sketches/drawings required

Mounting and mount access provisions

may drive your model design

Fabrication methods expected/material selection

Model fabrication timeline

Expected forces -- for model and sensor integrity

Check limiting cases analytically

-speeds, deflections, angles of attack-

Calculations/related tables are required for the review

Stress points/weak features/critical areas

-loads and capabilities identified-

Planned verification tests

Sketches/drawings and calculations must be reviewed by the MANE Academic Support Engineer, after the Wind Tunnel Oversight Committee gives its approval, in order to plan verification tests of the model and its support structure, before the model is installed in the wind tunnel.

Fit up and Integrity Check

Model interfaces and physical integrity must be confirmed prior to installation in the tunnel. This should be scheduled as soon as the model construction is complete. Since model modifications may result from this step, it should be scheduled at least 2 weeks prior to the test window, and before any final painting or installation of delicate sensors/electronics, if practical.

This will include:

- Review of the action items from the Preliminary Plan review, including any outstanding loading analysis required
- Model inspection/physical review
- A demonstration of mounting arrangements by fit up to the sting adapter to verify fit, if applicable
- Review of any mechanical integrity/dead weight tests determined during the preliminary review or upon the above inspection
- A review of the proposed test matrix

Preoperational check

This should be completed at least 1 week prior to the test window. If any significant outstanding items remain open, the reserved test window will be released.

- Review of all and closure of any outstanding action items from prior reviews
- Review of test plan summary
- Review of test matrix goals and priorities
- Review of any operational test requirements and operational protocols
- Verify safety training complete
- Approval of Test Plan

Model installation and Testing

Model installation may take several hours or more. Time may be available the day prior to the test window for model installation. Confirm this with the Wind Tunnel Oversight Committee and/or the Laboratory Academic Support Technician, and plan accordingly. On test day arrive promptly at your appointed time. Your test time must include breakdown and cleanup and transfer of any data files, etc. – and testing will be truncated to facilitate this. Plan accordingly.

To make sure you have all critical data, it is suggested you periodically reassess progress and priorities during the day, and adjust plans accordingly. **Any changes to the test plan must be documented and submitted to the Wind Tunnel Oversight Committee for approval. The subsequent steps noted above must also be followed.**